

AD-A159 103 BRIEF INTRODUCTION TO THE SOVIET CENTRAL RESEARCH
INSTITUTE OF AERODYNAMICS(U) FOREIGN TECHNOLOGY DIV
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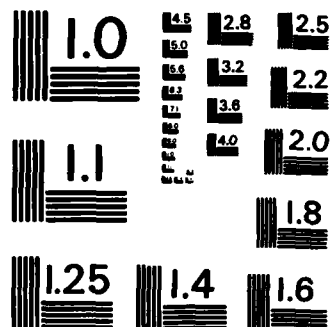
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FOREIGN TECHNOLOGY DIVISION

BRIEF INTRODUCTION TO THE SOVIET CENTRAL RESEARCH
INSTITUTE OF AERODYNAMICS

by

Yu. Yongziao, Zhang Ruqing



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BRIEF INTRODUCTION TO THE SOVIET CENTRAL RESEARCH
INSTITUTE OF AERODYNAMICS

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The Central Research Institute of Aerodynamics was established on December 1, 1918. The project was originally proposed by the National Economic Committee (BCHX) according to the suggestion of H. E. Zhukovskiy and approved by Lenin.

The first president of the Institute was H. E. Zhukovskiy (1918-1921), who had been recognized as the Father of Aviation in the Soviet Union. Zhukovskiy contributed greatly to the establishment of the mechanics as an independent science. He solved a series of mechanical problems relating to aviation using mathematical methods with experiments. He established also the experimental and the theoretical aerodynamics. The Department of Mechanics of the University of Moscow installed the first wind tunnel (it was also the first wind tunnel in Europe) in 1902 under the guidance of Zhukovskiy. With his leadership, the first research institute of aerodynamics in Europe was established in 1904 at Kuchino, a suburb of Moscow. Since Zhukovskiy had a keen sense and was decisive in managing many technical problems relating to practical flight, many graduates from Moscow Institute of Technology and University of Moscow, who had been trained by him, became his intimate assistants and were promoted to leading positions in the institute, such as C. A. Chapulejin (Russian name) (president, 1921-1942) and A. H. Duboliefu (Russian name) (vice president, 1918-1935).

-- The Central Research Institute of Aerodynamics is a composite research institute of aerodynamics having major activities on

7 solving various practical problems of aerodynamics in addition to general research activities. ^{Its} The main objectives ~~of the Institute~~ are as follows:

(1). Promote research and development on various problems relating to aerodynamics and fluid dynamics. Based on research results available, provide experimental data on wind tunnel tests for the design department *and*

(2). Provide assistance to related industries to solve problems on aerodynamics in research and applications. *△*

The original principles of setting up the Central Research Institute of Aerodynamics are to discover and to provide training of new technical personnel, to upgrade the equipment of research and development and to combine effectively research with practical work. Since the institute has been emphasizing strongly the development of new technical personnel, it has produced many young professionals, such as M. B. Kailerdis (Russian name), T.H. Bietelov (Russian name), H. Xiedov (Russian name), C. A. Helishiji-e-nuoweiji (Russian name). They have become the main forces in Soviet science and technology and some have been elected as the a Member of Science Academy.

The central Research Institute of Aerodynamics is the main research organization of aerodynamics. In addition to theoretical and experimental research on aerodynamics, it also carries out investigations on aeronautical devices, naval mechanics, and industrial aerodynamics.

As a composite research center, the institute has always kept an intimate relation with industries. The main subjects of research include aerodynamics, structural mechanics and material strength relating to airplanes or other aircraft.

During the initial stage when the institute was first established, it consisted of the engineering department of aviation, the department of naval aviation and testing, headed by A. N. Tupolov (Russian name), the department of aviation materials and structures, headed by H. H. Xiduolin (Russian name) and the department of propeller engines, headed by Shijieqijin (Russian name) .

Since the twenties, the test shop (led by Tupolov of the Central Research Institute of Aerodynamics completed many advanced designs of aircraft. Tupolov (Russian name) employed the hard lead alloys for aircraft fabrication as early as 1922. Under his leadership, the Central Research Institute of Aerodynamics in 1924-1925. manufactured the first group of all -metal prototype airplanes, AHT-2, AHT-3 and AHT-9. Tupolov (Russian name) had carried out investigations on more than 100 models of airplanes and more than 70 of them were carried on to production. He had broken 78 world records on aircraft manufacture such as the non-stop flight over the North Pole to the United States with the airplane AHT-25 piloted by Chikalov (Russian name).

During 1930 to 1932, the departments of engines, materials, test flight, and design were separated from the Central Research Institute of Aerodynamics to form four independent organizations, Soviet Research Center of Aviation Materials (BNAM), Central Research Center

of Aviation Engines (UWAM), Soviet Research Center of Fluid-dynamic Machine Manufacture (BWM) and Central Research Center of Wind Force (UBZH). After that, the Central Research Institute of Aerodynamics was able to concentrate the research efforts on aerodynamics, strength of the aircraft, fluid-dynamics and industrial aerodynamics.

The institute had been emphasizing building test equipment since the initial stage of establishment. The first test base was installed in 1925-1929. The base had the biggest wind tunnel in the world of that period. It installed also a test laboratory for fluid-dynamics, water tanks and other test equipment.

The construction of the test base proceeded under the leadership of G. A. Chapulejin (Russian name), who was the 2nd president of the institute. Chapulejin was a student and comrade-in-arms of Zhukovskiy. During the end of the 19 century and the beginning of the 20 century, he was mainly investigating jet flows and published a series of research papers. Aerodynamics became his major research work since 1910. He joined with Zhukovskiy to establish the institute in 1918. He became the president of the Institute in 1921 and was responsible for the second phase expansion of the test base during 1931-1941. Chapulejin (Russian name) was recognized as the labour hero of Soviet socialism in 1941 for his great contribution to the construction of the research institute as well as in the Soviet socialism. The Research Institute built a memorial statue for him in 1959. Presently, many streets in Moscow and New Siberia have been named after him. A volcano on the moon was named after him when man was successfully landed on the moon.

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The design of aircraft became more difficult and complicated due to progressive improvement of the performance and the increases of the flight altitude and the speed of the aircraft. This increased significantly the work loads of the Central Research Institute of Aerodynamics. The first phase test base was not big enough to handle all test jobs in the thirties and a decision was made by the Central Committee of The Soviet Union to construct a new test base of aerodynamics. A large amount of manpower of the institute was put in the construction of the new test base from the beginning of the thirties to 1941.

During world war II, the Central Research Institute of Aerodynamics served in the battle of anti-invasion. The advanced airplanes, of which the preliminary research had been completed pre-war, were produced in mass quantity shortly. Further improvements of the performance based on experimental data of full scale wind tunnel tests were suggested after that. Special task forces were assembled simultaneously to investigate the aerodynamic characteristics of the new advanced airplanes as well as the high speed aerodynamics with the consideration of air compressibility. This accelerated the development of jet airplanes in the Soviet Union after the war.

With increasing speed of the aircraft, many new problems in aviation were developed, and the original test base was required to be remodeled for improvement. Therefore, the main activity of the institute after the war was to expand the test base. Additionally, the institute had also investigated systematically the aerodynamics

and the strength of the helicopter and a calculation method was summarized for calculating the aerodynamic characteristics, stability, and maneuverability of the helicopter. This allowed the M. Milli (Russian name) Bureau of Design to design advanced helicopters with world standard. After that, the institute had a powerful test base equipped with many test equipment which were rare in the world, such as various full scale and reduced scale transonic wind tunnels, supersonic wind tunnels, high supersonic wind tunnels, wind tunnels with blade grill, test stations for power and strength of airplanes, etc.

The Soviet aviation industries developed rapidly during the thirties. Many design groups such as Migaoyang, Yakoliev, Yiliushen, Antonov, etc. (all Russian names) were formed. Therefore, the original departments of aviation, naval aviation and experimental engineering of the institute were separated and formed an independent Bureau of Experimental Design. The bureau had its own powerful test base.

The Central Research Institute of Aerodynamics kept an intimate relation with the Bureau of Experimental Design. The accomplishments of aviation science were actually the results of the combined efforts of the Research Institute and the Bureau of Design.

The Research Institute had emphasized strongly the research activities such as industrial aerodynamics, naval fluid-dynamics, pipeline ventilation engineering and wind energy utilization etc.

The research activities in the seventies had readjusted to emphasize on the activities such as calculation techniques,

instrumentation and information data following the rapid developments
in aviation and space flight. *to p 3*

The publications of the Central Research Institute included books, technical notes, technical reports, technical memos, summaries, publications of special topics, information data etc.⁺ The contents included the research results of many investigators of the institute and other related organizations on basic research of aerodynamics, applied research of aviation, space flight and industrial aerodynamics. *←*

The Central Research Institute is a composite research institute which combines theories, experiments and practice. The institute obtained a Labor Red Banner Medal in 1926 and another one again in 1933, and the Lenin Medal in 1945.

(Yu Yongxiao, Zhang Ruqing)

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